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PETROLEUM.

Handbook on Petroleum. By Captain J. H. Thomson and Boverton Redwood. Pp. xix+298. (London: Charles Griffin and Co., Ltd., 1901). Price 8s. 6d.

THE cooperation of Captain Thomson, H.M. Chief Inspector of Explosives, and Mr. Boverton Redwood, author of the encyclopædic "Treatise on Petroleum," in producing a handbook on the subject for the use, not only of officers of local authorities charged with the duties prescribed by the Petroleum Acts, but also of those engaged in the petroleum trade, strikes us as peculiarly happy.

The handbook commences with a short historical introduction, and the authors then proceed to a brief exposition of the theories of the origin of petroleum.

Whereas French and Russian chemists have supported the inorganic origin, a theory which in outline regards the oil as formed by the condensation under pressure of the gases generated by the action of water-vapour on metallic carbides, American geologists and German chemists favour the organic origin of petroleum.

Berthelot and Mendeleeff give the weight of their authority to the first theory, but there seems to be but little doubt that, though it is possible to produce petroleum in this manner, the organic origin is at once more probable and agrees better with the deductions of the geologist.

The supporters of the organic theory are also divided. The school of German theorists, among whom the names of Hofer and Engler stand out prominently, consider petroleum to be of purely animal origin, whereas many American geologists consider certain types, such as the oil of Pennsylvania, to be of vegetable origin.

At the meeting of German men of science and physicians at Munich in 1899, Krämer brought forward the view that petroleum is formed by the decomposition, under pressure, of the wax at the bottom of lakes and seas, which originated in the cells of diatoms; infusorial earth, which consists of the skeletons of Bacillariaceæ, exists in beds of enormous extent in districts where petroleum is found. In the discussion which followed, Engler, whilst admitting that some oil might be formed in this manner, upheld his view that petroleum is primarily derived from the submarine decomposition of fish, substantiating his theory by the announcement that he had found and analysed drops of petroleum from fossil bivalves in the Lias at Rothmatsch: we shall, however, be wisest to consider at present, with the authors of this book, petroleum to be of mixed animal and vegetable origin.

The next chapters are occupied by an account of the sources of supply, by a description of the methods for the production, refining and transport (the value of this section would have been considerably enhanced by diagrams and drawings), and by the enumeration of the names and chief properties of the commercial products of petroleum. Among much other useful information,

the difference between "benzene," "benzine," "benzol" and "benzoline" is clearly explained. The next two chapters are devoted to "flash-point" and "fire-test."

The term "flash-point," as defined by the Act of 1879, has given rise to much misconception; it is not "the point at which petroleum gives off an inflammable vapour," but the temperature at which the oil gives off sufficient vapour to form an inflammable mixture with the air, a matter which, as the authors remark, depends entirely on the experimental conditions.

A considerable uniformity was obtained by the adoption (Act of 1879) of the Abel test, but the apparatus is capable of considerable improvement, and this improvement is met with in the Abel-Pensky test, a modification adopted by the German Government, the use of which the authors hope will shortly be legalised in this country. As the flash-point is lowered 1·6° F. for every reduction of an inch in barometric pressure, it is important to introduce a correction depending on the height of the barometer; such a table of corrections is given in this handbook and is used in Germany, but has not as yet received the sanction of Parliament. The Abel and Abel-Pensky tests are described with great detail and clearness, as is also the elegant method for ascertaining the presence of small quantities of petroleum vapour devised by one of the authors, namely by the use of the Redwood test-lamp, the principle of which depends on the halo or "flame-cap" which surrounds the hydrogen flame when burning in an atmosphere containing a small proportion of inflammable gas—the appearance of the flame under these conditions is illustrated by an excellent coloured photograph, and the diagrams throughout this section are most useful.

The rest of the book is occupied by an account of the legislation relating to petroleum and calcium carbide, including the precautions to be taken in the storage of the oil, and remarks on the construction of petroleum lamps. This section, which, like the rest of the book, is extremely clearly written, should be studied by all oil-dealers, lamp-manufacturers and local authorities; we venture to think its perusal would repay "the man in the street."

The law with regard to petroleum in force at the present time is contained in the Petroleum Acts of 1871, 1879, and 1881, but the history of petroleum legislation is one of "laborious attempt and discouraging failure." Subsequent to the Act of 1881, a Bill of fifty-seven clauses was introduced (in 1883) and referred to a Select Committee of the House of Lords; this was followed by a tour of inspection and the drafting, in 1884, of a second Bill, followed in its turn by an extension of the tour to America. In 1888 important conferences were held and memoranda presented to both Houses; the inevitable Bill was introduced in 1891 and a Select Committee appointed in 1894, which was reappointed in 1896 and 1897 and which reported in 1898. In 1899 Mr. Reckitt, a member of the committee, introduced a private Bill to raise the flash-point from 73° F. to 100° F. (Abel test). The Bill was defeated, but the "lobbying" on this occasion was such as to induce Mr. Healy to express wonder whether "all this was pure philanthropy."

The authors proceed to consider the reasons for this want of success. The present Acts are by no means unworkable, and have the merit of simplicity; but they simply control the keeping of petroleum spirit (oil flashing below 73° F.) and in no way interfere with the sale or storage of petroleum oil (oil flashing above 73° F.).

Though the Acts leave everything to the local authority, yet they are deficient in provision for local control; the excessive decentralisation which puts in the hands of district councils throughout the kingdom the administration of such technical legislation cannot but militate against the attainment of the object in view. But the legislative failure is not due to these minor points, but rather to the strong opposition to the raising of the flash-point and to the attempt to prohibit dangerous lamps by legal enactment.

The objections to raising the flash-point are, firstly, that it is uncertain whether this measure would have an appreciable effect in preventing lamp accidents, which are, as a general rule, not caused by explosions, but by over-heating of the gallery and wick-tube and by breaking the lamp, in which cases no oil flashing under 150° F. can be regarded as absolutely safe; and, secondly, that raising the flash-point would indubitably cause a rise in the price of the oil, when there would be tendency to supply petroleum spirit for lighting purposes, this spirit commanding, under present conditions, a higher price than petroleum oil. The administrative difficulty of the prohibition of dangerous lamps must be patent to everybody.

The yearly average of fatal accidents from lamps is 129, and this period represents the lighting, burning and extinguishing of a lamp at least 4,000,000,000 times; now during a similar period, 5500 deaths are caused by falling down stairs, yet no one would suggest that in consequence houses must be restricted to one story; lamp accidents are nearly always caused by lamps being dropped, knocked over or pulled off tables when lighted and occasionally a lighted lamp is used as a missile.

The authors give much sound advice as to the purchase of safe lamps and, in an appendix, add directions for the care and use of petroleum lamps, the circulation of which recommendations in leaflet form by local authorities would doubtless be attended by beneficial results. The concluding chapter is devoted to calcium carbide and acetylene.

The first appendix deals with the imports of petroleum, from which it appears that the import of Russian oil is increasing, whereas that of American is decreasing—the enormous increase in the importation of “petrol,” motor-car spirit, is significant; in other appendices the Petroleum Acts of 1871, 1879, and 1881 are given, with comments and explanatory notes; memoranda and forms of license issued by the London County Council and a County Council report on the use of petroleum in manufactures and trades in London are also printed.

The book is well printed, clearly arranged, and possesses a good table of contents and an index; we must warmly congratulate its authors on having produced an altogether admirable handbook of the subject.

W. T. LAWRENCE.

COMMERCIAL EDUCATION.

Commercial Education at Home and Abroad: a Comprehensive Handbook, providing materials for a Scheme of Commercial Education for the United Kingdom, including Suggested Curricula for all Grades of Educational Institutions. By Frederick Hooper and James Graham. Pp. xiv + 267. (London: Macmillan and Co., Ltd., 1901.) Price 6s.

THE joint authors of this book are respectively the secretary of the Bradford Chamber of Commerce and the inspector for commercial subjects and modern languages to the West Riding County Council. They have done well to embody the results of their experience in a volume in which the promise held out in its somewhat lengthy title is creditably fulfilled. Very copious particulars are given in regard to the organisation and plans of commercial schools in the chief countries of Europe, notably France, Germany, Belgium and Switzerland. Designs of buildings, regulations and time-tables, both from these countries and from the United States of America, show in considerable detail how ample and varied is the provision made for the systematic teaching of “commercial” subjects, and how much our own countrymen have yet to learn in this department of national education. A considerable portion of the book is thus statistical and is made up of a great variety of official documents; but it is uncritical, and does not profess to do more than set forth existing facts, without discriminating very exactly between those portions of an elaborate programme which are of merely occasional and local importance and those which are entitled to rank as essential in every complete scheme of commercial and economic training.

In dealing with the conditions under which our own tentative efforts after such training have hitherto been made, the authors write with the authority which comes from intimate knowledge, and their suggestions are of much practical value. They rightly insist on the need of a good foundation of general knowledge before any attempt is made to differentiate the course of a boy's instruction in the direction of any trade or profession. But they urge that when the time for such differentiation arrives, there should be as much encouragement offered by public authorities to the training of skilled merchants as to the education of the skilled manufacturer or artisan. The policy of the Education Office, and the award of special grants and recognition for “Science and Art,” have helped to encourage a general belief that all efforts to prolong the education of a youth beyond the ordinary school age and to fit him for the practical business of life should take a scientific direction, the domain of “science” being understood to include chemistry, physics and other studies bearing on material industries and production. “At present,” the authors say, “provision is made whereby the science student may specialise in the direction of mechanical and electrical engineering, chemical industries and textile trades. But for the commercial student no such opportunity exists.”

The contention that this is too restricted a view of the aims and scope of a technical or continuation school is, in our opinion, well grounded, and ought to lead to a